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ABSTRACT

Discussed and compared are mathematics competencies as prescribed in grades 1-6 for seven state and local school districts utilizing the descriptive method characteristic of the Competency Based Education (CBE) movement. General comments on the historical background of the minimum competency trend and its distinguishing characteristics in various states and local school districts are also included. (Author/MP)

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The essay discusses and compares mathematics competencies as prescribed in grades 1-6 for seven state and local school districts utilizing the descriptive method characteristic of the Competency Based Education (CBE) movement. General comments on the historical background of the minimum competency trend and its distinguishing characteristics in various states and local school districts are also included.

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PATTERNS OF MATHEMATICS MINIMUM COMPETENCY SKILLS IN THE ELEMENTARY SCHOOL

Luis Ortiz-Franco

Introduction

Concern over the declining scores on the ACT and SAT by entering college freshmen, and the dissatisfaction of employers over the low level of skills in mathematics, reading, and writing by high school graduates has given rise to a movement in education referred to as the competency movement. Although this educational phenomenon is not new, its present flurry has been variously perceived as a potential tool for fundamental educational reform, education's newest bandwagon, back to basics movement, and a number of other labels including the Great American Education Fad of the 70's. Perhaps the most popular referent of this movement in educational circles is Competency Based Education (CBE).

Underlying the competency movement are many years of discussions and debates regarding educational accountability. State legislatures, and state and local school boards throughout the nation have devoted time and energies, and have allocated public funds to assure that students leave high school more competent than before and better prepared to contribute to society. And, as Spady and Mitchell (1977) say, "The term Competency Based Education (CBE) is serving as the unifying slogan for a growing movement among state policy makers to endorse and adopt new requirements for public school promotion and graduation . . ." (p. 9). But legislators and policy makers are pondering over the question of how to guarantee that students will emerge from high school equipped with minimum proficiency in basic skills. Some of the actions require that students be

able to read, write, and compute, generally at the eighth grade level, before receiving a high school diploma. Others require that students become proficient in solving everyday problems that adults face. The lack of consensus in specifying the particular everyday problems faced by adults that high school graduates should be able to solve is symptomatic of the larger issue of definition and conceptualization of the goals and aims of CBE. Spady (1977) puts this way, ". . . this CBE bandwagon cannot be accused of having put its conceptual house in order before launching on its uncharted parade route and accumulating a vast and lively following. . . . Basic definitions, conceptual clarity, and analysis of the organizational and social implications of various CBE approaches are badly needed." (P. 9.)

There are at least two different perceptions about the nature of CBE: the accountability movement and the educational reform movement.

Advocates of the educational reform movement perceive CBE as a way to expand student learning opportunities so that there will be more and better ways for students to learn and demonstrate the competencies required for the performance of complex life-roles. This perspective seems to be broader and more substantive than the accountability perspective. Proponents of the accountability movement want to define more sharply a limited range of learning opportunities that they expect schools to provide for students. These two perspectives represent different notions of the range of competency expectations: one is the distinction between competencies and capacities and the other is the concept of life-role.[1]

[1] For a lengthier discussion on these two notions see Spady and Mitchell (1977).

It is probable that these two notions have found advocates in state legislatures and school boards across the country and are being reflected in essential skills assessment batteries. The skills assessed across states or across school districts within a state are not uniform. Some states limit assessment to the areas of mathematics, reading and writing (the three Rs), others also include listening and speaking skills, and still others include all of these plus skills in citizenship, free enterprise, problem-solving, survival skills, reasoning, consumerism, reference skills, etc., (see Ajay [1979]). Many educators see CBE as an opportunity to strengthen program and teaching strategies that, in the process, cannot help but make gains.

The present note discusses and compares mathematics competencies prescribed in grades 1-6 for seven state and local districts. The discussion begins with general comments on the historical background of the present minimum competency movement; it then proceeds to outline some distinguishing characteristics of this movement in various states and local districts. These comments are followed by some considerations of the extent to which a common national framework of minimum competencies actually exists or is likely to exist. The various minimum competency mathematics skills for several state and local school districts are examined in this context. The discussion section summarizes the results and closes this note. Thus, the essay proceeds from the general to the specific and back to the general.

Minimum Competencies

General Characteristics

The competency movement is not something new. The history of American education is permeated with trends advocating instruction of students and the public at large with skills that will enable them to meaningfully participate in a democratic society. The roots of the competency movement are evident in ancient history. About 2,000 years ago, attempts were made to cultivate competency in oratory and military techniques. These competencies reflected the needs of particular societies. In primitive societies, the training of youth was clearly directed toward making them competent in survival skills.

The forerunners of the current movement to use standards to judge student competency appeared more than 100 years ago. Around 1865, teachers in New York developed tests to determine the competence of individual students in particular areas of study. The tests, known as the Regents Exams, were used to award Regents diplomas and to measure the performance of local school districts. This is perhaps one of the earliest indications of school accountability in any formal sense at the state level in the continental U.S. Two years later the federal government began to take steps to formalize documentation of the nation's progress in education. What influence teachers in New York had on this federal project is not obvious.

In any event, the United States Office of Education was founded in 1867 and one charge set before its commissioner was to determine the nation's progress in education. That century-old charge is only now being answered by the National Assessment of Educational Progress (NAEP).

a project of the National Center for Education Statistics under contract to the Education Commission of the States. NAEP provides information to educational decision makers and practitioners that can be used to identify educational problem areas, to establish educational priorities and to determine the national progress in education. However, NAEP does not assess minimum competencies as such.

One form of competency testing, the GED (tests of General Educational Development), has been used since 1942 to enable persons over 18 and out of school to receive a high school equivalency diploma. The Denver Public Schools developed and started to use minimum competency tests in 1960 to assure that students are proficient in reading, language, spelling, and math. Students have eight chances to pass. More recently, other districts have established policies which do not allow students to be promoted to a higher grade until necessary skills or competencies are mastered. Legislators and state boards are demanding that students meet minimum standards prior to being awarded a diploma and, in some instances, prior to being promoted to higher grades. That is, CBE is far from uniform across local school districts as well as across states. Before we discuss different approaches to CBE by some school districts, a few comments about CBE are in order.

CBE can be viewed as ". . . a data-based, adaptive, performance-oriented set of integrated processes that facilitate, measure, record, and certify within the context of flexible time parameters the demonstration of known, explicitly stated, and agreed upon learning outcomes . . ." (Spady [1977], pg. 10). And according to Spady and Mitchell (1977), there are two major convictions shared by advocates of CBE. One is that the

capabilities of too many high school graduates are inadequate to meet the requirements of life in modern societies. The other conviction is that schools must assure that useful and relevant student performance levels are achieved by establishing definite standards for student certification. The first conviction reminds us of the social utility of students outputs while the second conviction appears to adovcate a degree of school system accountability. These two elements combined form the rationale behind legislation requiring states or local school districts to set minimum standards of performance and to test student proficiency in meeting those standards. It is hoped that these mandates will result in more competent students.

The instructional aspects of CBE have, for the most part, been overlooked by the new policy adoptions at the state and local levels. CBE has induced a change in educational goals and perhaps the entire basis of recording student progress and reporting to parents will need to change as well. This is due to the possibilities of many students being able to qualify for a high school diploma by passing the state or local district test even without taking the full range of high school courses previously required for graduation. There are educators who opine that the accountability approach to CBE is flawed in its understanding of the essential character of school operations and therefore will not be effectively implemented.

With respect to methodology, there are basically two methods characterizing CBE: the descriptive, and the a priori or prescriptive. The descriptive method examines programs that describe themselves as competency based and seeks to discover the elements they have in common.

And the enumeration of those common elements serves as the definition of CBE in practice. The priori or prescriptive approach takes a set of meanings and conditions as given and derives a definition of the phenomenon from them. This leads to a theoretical definition of CBE which serves as a criterion or reference against which practice can be measured. It is this interplay between theoretical constructs and practical outcomes that motivates many educators to view CBE as generating a shift from role-based to goal-based operational principles in education. This shift imples that the criterion of successful program completion is the achieving and demonstration of outcome goals, not the length of time it takes to reach the goals. And as Spady and Mitchell (1977) put it: ". . . unless policy-makers and educators are able to grasp and are willing to deal with the serious consequences of goal-based education, CBE may well become one more abandoned bandwagon on the landscape of unfulfilled hopes for substantial educational improvement." (Pg. 15.)

An additional aspect that adds diversity, and perhaps makes CBE appear nebulous, is the lack of clarity on the best path to follow to reach the desired minimum competency standards. In some cases, state legislatures call for statewide standards; in others local districts are given guidance but not told specifically what to do. The following section gives a glimpse of the minimum competency trend in some state and local districts.

State and Local Trends

Prior to the advent of NAEP, the only readily available measures of educational quality resulting from the public investment of funds were

input measures such as teacher-student ratios and per-pupil expenditures. The tenuous assumption was made that the quality of educational outcomes, what students do or do not know and can or cannot do, was directly related to the quality of inputs to the educational system. For instance, $24.7 billion was the annual expenditure of public funds for the formal education of young Americans in 1960; $29.4 billion in 1962; and $35.9 billion in 1964.[2] As standarized test scores of educational achievement started and continued to show a downward trend in the late 60's and early 70's, many politicians, educators, and community leaders began to question the relative quality of educational outcomes. Thus, the accountability aspect of the competency movement has gained adherents to the point where now 38 states are involved in the competency testing movement. And different states have approached the matter differently.

Generally, the overall goal in recent mandates is to assure students reach a minimum level of competency in the basic skills at certain grade levels and prior to being awarded a high school diploma. Most of the mandates specify that student competency or proficiency be assessed through testing at certain grades in the required basic skills. In some states, the study of high school graduation requirements eventually has focused attention on basic skills in the early grades. As a result, requirements for minimum competencies as a prerequisite for high school graduation have been accompanied by other mandates to reinforce basic skills starting as early as the third grade. And this feature gives competency testing an aspect of diagnostic testing as opposed to achievement testing.

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[2]See footnote 1 in Carpenter et al. 1978, Pg. 3.

For example, Assembly Bill 3408, as amended by AB65, of the California Legislature calls for any high school district to adopt local standards of proficiency in basic skills by June, 1978. After June, 1980, no student who has not met these standards cannot receive a high school diploma. The progress of individual students toward these proficiency standards must be assessed by the districts at three prescribed intervals prior to the twelfth grade: once in the 4th through 6th grade experience, once during the 7th through 9th grade experience, and twice during the 10th through 11th grade experience. The Oregon board requires all districts to assess how well students can read, write, and compute. It also asks them to devise policies in new graduation requirements, starting in 1978. Districts must identify the minimum competencies needed for a diploma.

Other states, such as Florida and New York, have introduced new tests which help determine whether a student graduates with a diploma or a certificate of attendance. Florida introduced a functional literacy test in October 1977. A passing score of 70% is required both in communication and math. Students in New York must make a minimum score of 65% on five new basic competency tests administered statewide in reading, mathematics, practical sciences and health, civics and citizenship, and writing skills. Otherwise, they cannot receive a diploma, starting in 1980. A total of three-fourths of the states, or about 38, are involved in the minimum competency "movement." The "movement" is by no means unanimous.

In some states, legislation has been enacted and in others involvement has come about through state board of education rulings.

The Educational R and D Report issue of Spring 1979 lists the following states where legislation has been enacted mandating some type of competency-based high school graduation requirements: California, Colorado, Florida, Illinois, Kansas, Kentucky, Maine, Maryland, Nevada, New Jersey, North Carolina, South Carolina, Virginia, and Washington. An addition to this list is Louisiana with its Louisiana Accountability Law (Act 621). The same publication lists the following states where state boards of education have issued rulings regarding minimum competencies for high school graduation: Indiana, Massachusetts, New Jersey, Tennessee, Utah, Virgina, and Wyoming. The California and Florida legislation allow students to leave school early by taking a form of proficiency test. Students who pass receive the equivalent of a high school diploma and are permitted to bypass other graduation requirements. Other districts have established policies which do not allow students to be promoted to a higher grade until necessary skills or competencies are mastered.

Overall, efforts to set minimum competency standards have resulted in numerous approaches to the problem. The most discernible approaches include: requiring students to demonstrate competency for high school graduation, requiring students to demonstrate competency for grade-to-grade promotion, alternate approaches to granting credit for high school graduation, alternate approaches to establishing competency, and to use different types of diplomas/certificates. Neill (1978) discusses in more detail (Chapters VII and VIII) those states and local districts where minimum competency standards are used as high school graduation requirements, and as promotion/retention indicators. Perhaps the competency

movement will weaken the argument of those who claim that for many students the high school diploma is more a certificate of attendance than a certificate of competency.

Many educators see the competency movement as an attempt to give all students a chance to succeed in school. But, the students most affected are disadvantaged youth and those who are unmotivated to learn. This becomes more evident when we consider the four-to-five year achievement gap in reading, writing, and mathematics between the low-income and minority students, and the predominantly white middle and upper-income students. However, even for these students (minority and low-income), the competency testing movement can theoretically represent a hope for improvement. The possibilities of this being the case are increased if school districts and state boards see competency tests as a way to identify students not performing at minimum levels; to provide compensatory programs for those students; and to use the test results to direct state or local aid to those districts, schools, and students showing poorest performances. In this sense, the strongest argument in support of competency requirements is the potential for motivating students, schools, and districts.

The flurry of activity at the state and local levels has led some legislators to propose that national standards be set for minimum competency. The idea has received little support from educators and federal officials, both the Association for Supervision and Curriculum Development and the National Education Association have opposed federally mandated competency standards.

The idea of common national curriculums, and national minimum competency standards is not a politically viable one. However, a more basic question congruent to present realities is: are there enough commonalities in the present sets of minimum competency requirements among state and local districts for one to identify and outline national minimum competency expectations that already exist in practice?

The present note attempts to approach this question by comparing the stated minimum mathematics competency skills of seven state and local districts.

Methods, Analysis and Results

Method

In the context of the two methods characterizing CBE, descriptive and prescriptive (see page 6 for comments on these two methods), the method adopted here is the descriptive. The mathematics skills targeted for assessment in grades 1-6, as detailed by the Los Angeles Unified School District (LAUSD), Modesto, California School District, and by the State Department of Education in Florida, Kansas, Louisiana, New Jersey, Tennessee, and Texas provide the material for the analysis. The mathematics skills as outlined by LAUSD serve as referent point. Consequently, this analysis is relative and so are the descriptions of the skills provided by the different school districts. More precisely, the small number of districts included epitomizes the tenuous nature of the analysis. Furthermore, in the description of the skills discussed below, the LAUSD continuum has been used (without any value judgements) as a reference point, since it is longer and more comprehensive than most of the other sets of competencies. In addition, it is possible that

as the competency movement progresses towards its maturity the skills assessed will change to reflect more clearly identified needs of the times.

Six tables, one for each grade, illustrates the skills under consideration, and provide the framework for the analysis. The information contained in the tables was taken from outlines, objectives, and continuums available from the respective local school district or state education agency. In the case of Texas, the information available is from results of an actual assessment project conducted by the Texas Education Agency. For LAUSD and Louisiana, the information was obtained from their respective mathematics continuums; for Florida, Kansas, Modesto, and Tennessee the information was obtained from broad outlines. New Jersey provided a list of skills included in a survey administered to teachers and other school personnel. The purpose of the survey was for the state department of education to determine the adequacy of their preliminary list of mathematics skills. Consequently, there was no definite statement available at the time this paper was written on what skills New Jersey will finally assess.

Analysis and Results

Appendix A contains the six tables, one for each grade (1-6), outlining the mathematics skills targeted for assessment by seven state and local school districts, including: Florida, Kansas, LAUSD, Louisiana, Modesto, Tennessee, and Texas. Due to the reason stated above, the discussion does not include New Jersey but New Jersey is included in Figure 1.

Figure 1, below, shows the districts by alphabetical order, and the grades (1-6) for which mathematics skills are outlined.

Figure 1. Districts and Grades for Which Mathematics Skills are Listed.

District	Grade					
	1	2	3	4	5	6
Florida		X		X		
Kansas		X		X		X
LAUSD	X	X	X	X	X	X
Louisiana	X	X	X	X	X	X
Modesto	X	X	X	X	X	X
New Jersey	No definite statement available on what skills would be assessed. Survey indicates mathematics assessment at grades 3 and 6 would take place.					
Tennessee	X	X	X	X	X	X
Texas						X

The remaining part of this section is devoted to a discussion of the mathematics skills described in Tables 1-6 in Appendix A. As mentioned before, the method used is the descriptive. The skills are grouped in ten major sections or skill areas, namely: Numeration, Whole Number Operations, Fractional Numbers, Decimals, Geometry, Measurement, Relations/Functions, Statistics, Percent, and Applications/Problem Solving. This breakdown is adapted from the organization of the LAUSD continuum, and each of these skill areas subsumes other more specific skills. To illustrate, the skill area of Whole Number Operations subsumes skills in addition, subtraction, multiplication, and division; and in turn, each of these operations subsumes more specific skills. For instance, addition includes skills in basic facts, addition of two or more numbers with one,

two, three, four, or more digits, with and without regrouping. Usually, the complexity and degree of difficulty of the skills assessed increases as the grade level increases.

Numeration. The LAUSD mathematics continuum outlines three skills under Numeration to be assessed for elementary school students. These are counting and place value, comparison, and primes, multiples and factors. Louisiana also includes an enabling skill with sets in 1-1 correspondence at grade 1 and Tennessee includes a few skills with Roman Numerals at grades 3-6. In general, first grade LAUSD students are supposed to be proficient in more skills than their counterparts in Modesto, California but in fewer skills than first graders in Louisiana and Tennessee. No skills for assessment are listed for Florida, Kansas, New Jersey, and Texas at this grade level.

Only LAUSD, Louisiana, and Tennessee list numeration skills for third graders. At grade 3, Tennessee introduces students to writing Roman Numerals. The skill listings for Louisiana and Tennessee portray a little wider scope and little more depth in the numeration skills demanded from third graders than the other lists.

The Modesto, California school district does not list numeration skills for assessment at the fourth grade level. The counting and place value skills scheduled for LAUSD fourth graders are about the same as those scheduled in Florida, Kansas, Louisiana, and Tennessee, but the latter also include some skills in rounding, ordinality, and ordering numbers that go beyond the simpler skills expected at grades 1-3. Tennessee increases exposure of students to Roman Numerals. LAUSD and Louisiana expect fourth graders to become proficient in naming the

multiples of 5 and 10 but Louisiana expects students to also supply the missing numbers in a sequence of these multiples, and in a sequence of odd and even numbers 100-1000. Kansas introduces students to numeration on the number line.

By the end of the fifth grade, Tennessee students are expected to be able to write up to 500 using Roman Numerals, and to estimate sums and differences by means of rounding off. Otherwise, the cumulative mathematics skills assessed at the fifth grade in LAUSD, Louisiana, and Tennessee are quite similar. Most of the differences in the cumulative skills appear to be due to level of difficulty at which students are expected to operate, but not in the kinds of skills expected.

No rounding off skills are listed as minimum competencies for sixth graders in Texas. The sophistication level of place value interpretation, and reading and writing numerals is a bit above that of Kansas, but seems to be below LAUSD, Louisiana, and Tennessee. No other numeration skills are listed for Texas. Recognition of Roman Numerals, and negative integers on a number line listed by Tennessee, grade 6, are not found in any of the other lists. Otherwise, the lists for LAUSD, Louisiana, and Tennessee are about the same.

Whole number operations. The lists for whole number operations are divided into four major subareas: addition, subtraction, multiplication, and division. Multiplication and division begin to be assessed at third grade; addition and subtraction skills in some form are assessed throughout all six elementary school grades. Each of these four operations is discussed separately in the following paragraphs.

LAUSD first grade students are expected to find sums up to 10 involving numbers and sets, which is common in grade 1. Students in Modesto are only expected to find sums up to six while Tennessee first graders are expected to have developed one or two additional skills such as recognition of the commutative property and some addition of multiples of ten (e.g., 30 + 40 = _____).

At the second grade level, there is a similar pattern. Tennessee second graders are expected to demonstrate some understanding of math symbols for comparison and the concept of multiplication as repeated addition. Otherwise, the lists for LAUSD, Modesto, California, Florida, Kansas, Louisiana, and Tennessee are about the same.

Addition of numbers with more than one digit requiring regrouping is common across all four lists for grade 3. Louisiana also includes identification of the parts of addition but this is relatively minor. The addition skills assessed at the fourth grade reflect a further development and reinforcement of performing addition with regrouping. This same pattern continues in all lists up to the sixth grade. Thus the differences that do exist between districts in addition skills from 4th through 6th grades reflect minor variation in difficulty rather than major variations in the kinds of skills to be assessed.

Skills assessment and development in subtraction parallel that of skills in addition, indicating that for most schools instruction in subtraction closely follows instruction in addition. Subtraction with regrouping begins to be assessed at the third grade and its development and reinforcement continue through the 6th grade.

Second grade pupils in Tennessee are introduced to multiplication by means of repeated addition. Otherwise formal skills in multiplication are scheduled for introduction and assessment at the third grade in LAUSD, Modesto, Louisiana, and Tennessee. Although LAUSD programs have more basic facts at grade 3 than any of the other districts, Tennessee picks up at a higher level skill (multiplication with regrouping) presumably involving only the facts (to 5's) that students are supposed to know at grade 3.

With the exception of Modesto, all of the districts outlining multiplication skills for fourth graders expect pupils to be well versed in the basic facts. At grade 4, the LAUSD list moves ahead to multiplication with regrouping, but only with multipliers up to 10, while Louisiana expects fourth graders to know the parts of a multiplication problem. Otherwise, the sophistication level in the multiplication algorithm is not very different across lists, except for Modesto where multiplication does not go beyond multiplication facts up to 6's.

It is not until the end of the 5th grade that students in Modesto are formally assessed in multiplication facts through 81. At this grade level Tennessee extends multiplication facts up to 12's. LAUSD continues the development and reinforcement of multiplying numbers by powers of 10. Otherwise, LAUSD, Modesto, Louisiana, and Tennessee do not differ substantially in the nature of the multiplication skills they assess.

Louisiana explicitly expects sixth graders to be able to multiply any number by powers of 10 in addition to exhibiting the multiplication

skills found in lists for Texas, Tennessee, Kansas, Modesto, and LAUSD. By the end of grade 6, all the lists show similar multiplication skills.

LAUSD and Tennessee are the only lists which expect to test third grade pupils on basic facts in division. At the end of the fourth grade, Florida and Kansas formally assess proficiency on basic facts in division. Louisiana includes assessment of division facts, but stops with divisors up to 6. LAUSD, Florida, Kansas, and Tennessee extend their lists to include the division of a two-or-more-digit number by a one-digit number. Kansas and Tennessee go so far as 2-digit quotients which the LAUSD list does not reach until grade 5.

By grade 5, the lists for LAUSD, Modesto, and Louisiana are at about the same level: division by a 1-digit number with no restriction on the size of the quotient. Tennessee goes a step further by including problems with 2-digit divisors. Florida, Kansas, and Texas have no assessments at grade 5.

There is considerable variability across lists at grade 6 representing significant differences in difficulty. The LAUSD and Modesto lists never really get very far into division by 2-digit numbers while the other lists do. The Tennessee list is an order of difficulty higher than the others in calling for division by 3-digit numbers.

Fractional numbers. This skill area contains four subareas: numeration, addition, subtraction, and multiplication. Division with fractional numbers is also listed for assessment in Tennessee and Kansas.

As shown in Table 1, LAUSD and Tennessee are the only districts which begin assessment of fractional number concepts in grade 1. LAUSD assessment is limited to identification of whole objects while Tennessee goes on to assess $\frac{1}{2}$'s and $\frac{1}{4}$'s. Tables 2 and 3 show that skill assessment in fractional number numeration only continues up until the end of the 3rd grade.

At grade 4, Tennessee, Florida, and LAUSD begin to assess skills in the addition and subtraction of simple fractions with like denominators without regrouping. Florida, Kansas, and Louisiana limit their assessment to numeration skills identical to those assessed by LAUSD and Tennessee at the previous grade level. Florida also lists skills in identifying equivalent fractions.

By the end of the fifth grade, Tennessee students are supposed to have developed skills in the four basic operations with fractional numbers but students in Louisiana and LAUSD must exhibit skills in addition and subtraction only. Tennessee and LAUSD list skills in identifying and finding equivalent fractions at this grade level. Louisiana, on the other hand, postpones listing these skills until the six grade.

Decimals. Grade 5 students in Louisiana, Tennessee, and LAUSD are assessed on numeration, addition, and subtraction skills with decimals. Kansas and Modesto schedule assessment of this skill area in the sixth grade. As outlined in Table 5, the skills in the Louisiana list are more numerous and at a higher level than LAUSD and Tennessee.

Texas does not schedule assessment of skills involving decimal numbers at grade 5 or 6, although it is unlikely that students would be allowed to miss instruction in this area. As evidenced by the assessment schedule, Modesto and Louisiana expected proficiency in the addition and subtraction of decimals by the end of the sixth grade but Tennessee, Kansas, and LAUSD expect some level of proficiency in all four basic operations. Of these three, LAUSD seems to be the only one not explicitly requiring skills in multiplying two decimal numbers. Otherwise, it appears that there is quite a lot of similarity in what students are expected to learn.

Geometry. There are two major subareas under geometry: non-metric and metric. Skills in non-metric geometry are assessed throughout the elementary school experience but skills in metric geometry begin to be assessed at the fourth grade level. There is almost no difference in the type of non-metric geometry skills required of first grade students in Louisiana, Tennessee, and LAUSD. The skill of matching geometric shapes to outline is assessed only in LAUSD and Florida districts at the 2nd grade level. The other districts do not outline skills for assessment in this subarea at this grade level.

The non-metric geometry skills illustrated by Louisiana for third grade students are similar to LAUSD's second graders. LAUSD is the only district that includes open and closed curves. In general, there is far less consistency across skills listings in geometry than in other areas. Those skills in non-metric geometry required of Kansas fourth graders are similar to those required by LAUSD at the

second grade level. Fourth grade pupils in Louisiana and LAUSD are tested on metric geometry skills involving perimeter measurement of plane figures. Several of the skills in non-metric geometry outlined by Tennessee at the fifth grade appear in the fourth grade LAUSD assessment program. Louisiana and LAUSD outline the same skills in metric geometry but neither Tennessee nor any of the other districts list skills in this subarea for fifth grade students. In addition, the recognition of solids included under non-metric geometry in LAUSD is not listed by any of the other districts. Kansas is the only district which expects sixth graders to exhibit some competency in finding the area of rectangles. Louisiana, like LAUSD, expects 6th grade students to be able to identify a right angle. The skill of identifying relationships between lines, outlined by Louisiana at grade six, is expected from pupils at grade 5 in Tennessee.

Measurement. There are seven subareas distributed in grades 1-6 under the skill area of Measurement. The subareas are: Length, Mass, Area, Volume/Capacity, Time, Temperature, and Money. The distribution or representation of these subareas in the elementary school grades is not even. Not all skill subareas appear in every grade level nor are they equally distributed. Some skills are assessed more often than others. For instance, in LAUSD, Money skills are assessed in five grades but skills with Mass are assessed only once.

First grade pupils in LAUSD are assessed on Mass and Money skills while Louisiana first graders are assessed on Mass and Length skills; while Tennessee students are expected to show competency in Time,

Money, Length, Temperature, and Volume/Capacity. Modesto does not assess measurement skills in grade 1, while Florida, Kansas, and Texas have no grade 1 assessment at all.

Skills in the subareas of Length, Time, and Money are assessed in grade 2 in LAUSD, Florida, Louisiana, and Tennessee. Modesto expects competency from second grade pupils only in the subarea of Money, and Kansas in the subareas of Money and Time. Tennessee also expects some competency in Temperature skills.

By third grade, LAUSD's pupils are supposed to have developed some additional skills in Length, Time, and Money; Modesto students in Money only; Louisiana third graders in Length, Volume/Capacity, Mass, Time, and Money, and Tennessee pupils in Length, Volume/Capacity, Temperature, Time, and Money. Thus, Tennessee and Louisiana third graders are assessed in five Measurement subareas, LAUSD's students in three, and Modesto students in only one.

Fourth grade students in Louisiana are assessed in five skill subareas: Length, Area, Money, Mass, and Volume/Capacity, and Tennessee students in all of these subareas except Area, and including Time and Temperature as well. LAUSD fourth graders are expected to show some competency in Length, Area, Time, and Money; Kansas, in Length, Area, and Money; and Florida in Length, Time, and Money. Modesto lists skills only in the Time subarea of measurement at grade 4.

Modesto, Florida, and Kansas do not list any Measurement skills for assessment at the fifth grade but LAUSD lists skills in five

subareas, namely, Length, Area, Volume/Capacity, Temperature, and Money. Louisiana and Tennessee each list skills in two subareas, Mass and Time, and, Time and Length, respectively. LAUSD emphasizes both estimation and actual measurement skills in the Length, Area, and Volume/Capacity skill subareas but Tennessee and Louisiana include only actual measuring skills in Length and Mass.

Four districts show intentions of assessing Measurement skills at the end of the sixth grade: LAUSD, Kansas, Louisiana, Tennessee, and Texas. LAUSD and Texas expect similar competencies from sixth graders in the same skill subareas, Length, Mass, Area, and Volume/Capacity. The Kansas list only includes skills in the Length subarea. Louisiana expects competencies in Time, Temperature, and Area and Tennessee in Length and Area only. However, the skill expected from sixth graders in Tennessee in the Length subarea is that of applying the addition and subtraction algorithm to Measurement units involving renaming, which is a somewhat different skill than just estimating or measuring.

Relations/functions. Formal assessment of this skill area begins at the end of the 3rd grade in LAUSD and Louisiana. There are two subareas subsumed under Relation/Functions: Patterns and Coordinate Geometry. Perhaps due to the various skills involved in Coordinate Geometry, skills with Patterns are initially assessed at the end of the third grade but Coordinate Geometry is first assessed a grade later. At the third grade level, however, Louisiana expects more from students in the subarea of Patterns than LAUSD. In both cases, third graders are supposed to have developed competencies in recognizing and extending

number patterns, but, Louisiana students are also expected to demonstrate certain skills with some properties of zero.

Part of the Patterns skills assessed by LAUSD and Louisiana at the third grade level are assessed by Tennessee at the end of the fourth grade. Louisiana expects its fourth graders to have skills in recognizing and applying mathematical symbols and in the use of one as the identity element in multiplication. LAUSD is the only district that schedules basic skills in Coordinate Geometry for assessment at the fourth grade.

At the fifth grade level, only one district, LAUSD, outlines skills in Patterns and Coordinate Geometry for assessment. The skills assessed, though, do not represent any essentially new skills in these subareas. The skills assessed are an extension of those skills developed in the third and fourth grades.

Louisiana sixth graders are expected to be able to determine the equality relation when given groups of numbers and specified operations. On the other hand, LAUSD outlines skills in Patterns and Coordinate Geometry for proficiency by sixth grade pupils.

Statistics. In these skill listings, students begin to be tested on Statistics at the third grade. LAUSD and Tennessee schedule assessment of data collection, organization, and interpretation at the end of the third grade. Tennessee expects a bit more from these pupils than LAUSD. No other district outlines skills in Statistics at the third grade.

Five school districts, LAUSD, Florida, Kansas, and Tennessee, outline skills in Statics for assessment at the fourth grade. Skills

in the Louisiana list for grade 4 are about the same as skills listed in grade 3 for LAUSD and Tennessee. Although Florida and Kansas do not schedule assessment of skills in Statistics at the third grade, those Statistics skills that they assess at the fourth grade are comparable to LAUSD's fourth grade skills. No school district assesses this skill area at the fifth grade.

Tennessee, Louisiana, Kansas, and LAUSD assess Statistics in grade six but LAUSD and Kansas are the only lists that include computation of means (averages) from a set of data.

Percent. Perhaps due to the various skills with whole numbers and fractions required to compute percents, skill assessment in Percents is conducted for the first time at the sixth grade. Tennessee and LAUSD are the only school districts which assess this skill area. The level of skill difficulty is higher for Tennessee than for LAUSD.

Applications/problem solving. Not all lists include assessment of Application/Problem Solving in all of the elementary school grades. Only Louisiana and Tennessee schedule assessment of this skill at the end of the first grade. Louisiana expects students to exhibit some competency in solving word problems, but not to do the actual computation.

Five districts, LAUSD, Florida, Kansas, Louisiana, and Tennessee list problem solving skills for assessment at the 2nd grade. The LAUSD list does not state explicitly that students are expected to solve word problems but the other four lists do so.

Tennessee, Louisiana, and LAUSD schedule assessment of problem solving skills at the end of the third grade. Tennessee expects

pupils to solve one-step word problems involving the four basic operations, and Louisiana outlines skills in solving word problems involving only three basic operations, excluding division. At grade 3, the LAUSD list is the only one which explicitly includes the assessment of problem solving skills involving money values.

Florida expects fourth grade pupils to solve purchase problems not exceeding one dollar, to solve word problems involving addition, subtraction, and multiplication of whole numbers, and the addition and subtraction of proper fractions with like denominators. No other list outlines problem solving skills involving fractions. Kansas and Tennessee require the solution of word problems involving the four basic operations. LAUSD and Kansas expect fourth graders to make up a real-life problem from a number sentence and solve it.

While fifth graders in Tennessee and Louisiana are assessed on the solution of two-step word problems, Modesto and LAUSD pupils are required to solve only one-step word problems. LAUSD, Louisiana, and Tennessee begin assessing problem solving skills involving measurement units at this grade level. However, Tennessee is the only list at grade 5 that explicitly includes work with whole numbers, fractions, and decimals.

At grade 6, Texas and Tennessee expect students to demonstrate competency in estimating and solving word problems involving the four basic operations with whole numbers, fractions, and decimals. This is the extent of Tennessee's assessment of problem solving skills but Texas also includes assessment of measurement problems, like LAUSD, using basic operations. Sixth grade pupils in Kansas and Modesto are asked to show competency in solving word problems but Modesto does not specify the

type of operations involved. Kansas expects students to solve one-step word problems involving the four basic operations but LAUSD is not as specific.

Discussion

This section provides general comparative comments on the skills assessed in the elementary school by the state and local districts under discussion and will attempt to answer the question posed at the end of the Minimum Competencies section.

The pattern of the quantitative and qualitative differences of the skills assessed in grades 1-6 by the LAUSD, Modesto, California, Florida, Kansas, Louisiana, Tennessee, and Texas school districts is too uneven to permit an absolute generalization. It cannot be said that any of these school districts strives to develop in students better mathematics skills than the others. When we look at a particular grade level, say first grade, and at a particular skill area, say Numeration, the pattern of skills in one list may be more difficult and more extensive than another list. But the pattern is not likely to persist if we shift skill area and/or grade level. For example, if we look at the skill areas of Fractional Numbers and Geometry in LAUSD and Tennessee, we could make the following overall generalizations. Tennessee requires more complex skills grade by grade with Fractional Numbers at an earlier age. However, the pattern is reversed when we shift the focus to Geometry where LAUSD assesses some skills in non-metric and metric geometry that are not assessed at all in Tennessee. On the other hand, most of the skills in Fractional Numbers assessed by Tennessee are eventually assessed by LAUSD.

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Appendix A

Table 1: Mathematics Skills Assessed by State and Local School District:

First Grade

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area				Match concrete and semi-concrete objects in one-to-one correspondence. Identify equivalent and non-equivalent sets.		Compares two sets and determine which has more, fewer, or same number of elements.	
A. Numeration						Recognize place value for 1's, 10's, and 100's.	
Counting and Place Value							
1. Identifies cardinal numbers 0-10 from a set of objects				same		Recognize numerals 0-100 and match them to numeration models.	
						Count and write by 1's, 5's, and 10's to 100. Identify words 0-10.	
2. Counts, reads, and writes 0-30	Write to 20 by ones Count to 30 by ones			up to 10			
Comparison	Identify which set has more, less, or same					Compares two numbers 0-50, and recognizes the mathematical terms more than, less than, equal.	
3. Orders numbers 0-10							
4. Identifies ordinal numbers 1st - 5th	Identify the rank 1st - 3rd			Through 10th		Through 10th	

Table 1: Mathematics Skills Assessed by State and Local School District:

First Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area				Supply missing number in a sequence through 10.			
B. Whole Number Operations							
Addition							
5. Demonstrates the concept of addition by joining two sets of objects whose sum is 10 or less				Up to 12		Recognize the use of symbols +, =, and the mathematical term add.	
						Understand the commutative property of addition and that zero is the identity element of addition.	
6. Finds sums thru 10 (basic facts)	Addition facts thru six			Same		Same plus add multiples of 10 up to 100.	
Subtraction							
7. Demonstrates subtraction by separating from a set of 10 or less objects						Recognize the use of the symbol −, and the mathematical term subtract, and that zero is the identity element for subtraction.	
8. Substracts single-digit numbers from minuends through 10 (basic facts)	Subtraction facts thru six					Same plus subtract multiples of 10.	

Table 1: Mathematics Skills Assessed by State and Local School District:

First Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
C. Fractional Numbers							
Numeration							
9. Identifies whole						Identify 1/2, 1/4 of a region when whole is shown.	
D. Geometry						Recognize number patterns filling in numbers, sequence, and patterns.	
Non-metric							
10. Compares objects by describing likeness and differences.							
11. Classifies objects by color, shape, and size.				Same		Same	
12. Identifies geometric shapes: circle, square, and triangle.				Same plus rectangle		Same	
E. Measurement							
Time						Same plus tell time to the hour using a standard clock.	
13. Identifies sequence of events: before, after, first, next, and last.				Identify lighter or heavier objects, and shorter or longer line segments.		Mark specified days and dates on calendar.	

Table 1: Mathematics Skills Assessed by State and Local School District:

First Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Money 14. Identifies and names penny, nickel, dime, and quarter				Under problem solving the following skills are included: combine the members or elements of sets of concrete and semi-concrete objects; add members of a set up to 5; and solve word problems involving sums up to 10 or minuends up to 10.		Same plus including the half-dollar. Find the ¢ value of a collection of coins up to 25¢. Measure to nearest inch or centimeter. Recognize a thermometer as an instrument for measuring temperature. Compare liquid capacities using cup, pint, quart, and liter. Identify largest and smallest. Compose simple number sentences for verbal and picture story problems.	

Table 2: Mathematics Skills Assessed by State and Local School District:

Second Grade

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area			Identify the standard numeral for a 2-digit number expressed in 10's and 1's. Identify the number between 10 and 100 given four numerals.	Recognize the empty set and recognize related and non-related objects in a collection. Order sets of pictures as designated and compare and construct sets.		Identify odd and even numbers 1-20	
A. Numeration							
Counting and Place Value							
1. Identifies, counts, reads, and writes numerals and expresses place value thru 99	Write 1-50	Same, except place value skills		Same		Up to 200. Match number words to numerals up to 20.	
2. Counts by 10's and 5's to 100			Determines the next number of a sequence by 2's, 5's, or 10's	Same plus also writes in same sequence up to 100.		Same	
3. Counts by 2's to 20				Up to 100		Same but up to 100	
4. Counts backwards from 10							
Comparison							
5. Orders numbers thru 99	Order numbers 1-20	Same	Given two consecutive even or odd numbers to determine the number in between.			Determine which number is less than or greater than up to 100.	

Table 2: Mathematics Skills Assessed by State and Local School District:

Second Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
6. Identifies a number that comes before or after a given number.		Identify the smaller or larger of any two numbers less than 20.	For numbers less than 9, identifies the number which is 1 more than the one given.				
7. Identifies ordinal numbers, 1st - 10th		Same	Up to fourth	Same		Matches cardinals to ordinals up to 20th.	
8. Whole Number Operations						Understands the math symbols: +, =, −, >, <.	
Addition			Adds two 1-digit numbers with sums up to 14.				
8. Knows facts thru 18 (basic facts).	Addition facts thru 12	Same Add any three 1-digit numbers with sums thru 18	Add a 1-digit number and a 2-digit one with no regrouping	Same and also add three 1-digit numbers with sums up to 9.		Same plus knowledge of commutative property. Knowledge that multiplication is repeated addition.	
9. Adds two numbers, up to 2 digits each, no regrouping	Same	Same Add a 1-digit number to a 3-digit number, without regrouping	Same	Same plus add a 1-digit number and a 2-digit number		Same plus add three 1-digit numbers with sums to 18	
Subtraction							
10. Subtracts single digit numbers from minuends thru 18 (basic facts).	Subtraction facts thru 12	Same	Subtract a 1-digit number from itself or subtract zero from the 1-digit number	Subtraction facts with minuends up to 10			

Table 2: Mathematics Skills Assessed by State and Local School District:

Second Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
			Subtract two 1-digit numbers whose sum is 9 or less.				
11. Substracts 1- and 2-digit numbers from 2-digit numbers, without regrouping		Same Group 12 or fewer objects into sets of equal amounts (no remainders)		Same plus subtract a 1-, 2-, and 3-digit number from a 3-digit numbers without regrouping		Same	
C. Fractional Numbers							
Numeration							
12. Identifies one-half, one-fourth, and one-third of a whole number		Same		Same		Same plus 2/3 and 3/4.	
D. Geometry							
Non-metric							
13. Identifies geometric figures of same shape/size by matching shape to outline: circle, square, and triangle.		Same plus rectangle					
14. Identifies geometric shapes: circle, square, triangle, and rectangle							

Table 2: Mathematics Skills Assessed by State and Local School Districts

Second Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
E. Measurement						Read a Fahrenheit or Celsius thermometer	
Length							
15. Measures length in non-standard units by counting		Same plus skills with inch and centimeters		Identify inch and foot as units of customary linear measurement		Recognize units of measurement: inch, foot, centimeter, meter, cup, pint, quart, gallon, liter, and year.	
Time							
16. Reads clock to specify time on the hour		Same plus state time on the half-hour state days of the week in order	Same	Same plus identify the hour and minute hand on clock. Name days of week and months of year, and relates event to time (morning, noon, night)		Tell time to the half-hour. Read and use a monthly calendar	
Money							
17. States value of penny, nickel, dime, and quarter in cents (¢)	Identify a penny, nickel, dime, quarter and half-dollar	Same	Up to five pennies	Same plus identify the ¢ symbol		Identify the coins: penny, nickel, dime, quarter, and half-dollar and count up to one dollar with coins of equal value.	
F. Applications/Problem Solving							

Table 2: Mathematics Skills Assessed by State and Local School District:

Second Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA*	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
18. Writes a number sentence to describe real-life situation		Solve real-world problems involving addition and subtraction of two 2-digit numbers without regrouping. And purchase problems involving no more than 50¢	Solve a word problem involving the addition of two 1-digit numbers	Same for sums and minuends of 10		Solve simple one-step word problems involving addition (regrouping as necessary) and subtraction (no regrouping)	
19. Makes up a real-life problem from a number sentence.				Solve oral addition and subtraction problems, sums of 10 and minuends of 10.			

*The state of Florida identifies these skills at the beginning of Grade 3 and are thus comparable to LAUSD's end of Second Grade.

Table 3: Mathematics Skills Assessed by State and Local School District:

Third Grade

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area				Identify number words for multiples of 10 (20-90)		Count by 2's, 3's, 5's and 10's up to 100.	
				Identify number words 11 thru 19.		Read and write word names for numbers up to 100.	
				Write to 100 by 2's Use ordinal numbers thru 19th		Count by ordinals to 25th	
A. Numeration					Teachers and other school personnel were asked to respond to a survey to determine what skills to assess. The proposed assessment program covered grades 3, 6, 9, and 11. Consequently, no statement can be made at this point regarding the skills assessed at the above grade levels.		
Counting and Place Value							
1. Reads and writes numerals and expresses place value through 999				Same		Same plus read and write Roman Numerals up to XII.	
Comparison							
2. Orders numbers thru 999				Supply missing numbers in a sequence thru 100			
3. Identifies even and odd numbers				Write the number that comes before or after a given number (1-99)		Up to 50 Round numbers to nearest 10 and 100	
B. Whole Number Operations							
Addition							
4. Adds two 2-digit numbers, regrouping as necessary	Same			Add four 1-digit numbers and compute sums to 99 with zero as one of the addends.		Recall basic facts plus add 3-digit numbers, regrouping as necessary	
				Same plus add a 3-digit number and a 1-, 2-, and 3-digit			

Table 3: Mathematics Skills Assessed by State and Local School District:

Third Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
				number with no regrouping and regrouping in the ones place only. Add a 2-digit number and a 1- and 2-digit number with regrouping in the ones place only Identify the parts of an addition problem			
Subtraction							
5. Subtracts two 2-digit numbers with regrouping	Subtract 2-digit numbers without borrowing			Same plus identify the parts of a subtraction problem and compute differences to 99 with zero in the subtrahend.		Recall basic facts plus subtract 3-digit number, regrouping as necessary	
6. Subtracts two 3-digit numbers, without regrouping				Subtract a 1-digit number from a 2-digit number, minuend to 18 using basic facts and concrete objects, and with and without regrouping. (The skill of subtracting two 3-digit numbers is not included).			

Table 3: Mathematics Skills Assessed by State and Local School District:

Third Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
Multiplication							
7. Finds products thru 81 (basic facts)	Know multiplication tables for 0's, 1's, 2's, and 5's			Multiply two 1-digit numbers (products thru 36)		Recall multiplication tables to 5's and multiply a 2-digit number by a 1-digit number, regrouping as necessary	
Division							
8. Finds quotients for dividends thru 81 (basic facts)						Division facts up to 45 ÷ 5	
C. Fractional Numbers				Reads, writes, and shades the fractional parts of a whole, 1/2, 1/3, and 1/4		Identify and write common fractions: 1/2, 1/3, 2/3, 1/4, and 3/4	
9. Identifies the number of equal parts in a whole							
D. Geometry				Associate the words: circle, triangle, square, and rectangle with their visual representation and draw a facsimile of these figures			
Non-metric							
10. Identifies open and close curves							

Table 3: Mathematics Skills Assessed by State and Local School District:

Third Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area						Use measuring devices involving cup, pint quart, gallon, and liter.	
E. Measurement				Identify centimeter and meter as metric linear units			
Length							
11. Measures to nearest centimeters				Same		Use measuring devices involving in foot, yard, centimeter, and meter	
12. Measures to nearest inches				Same			
				Recognize the cup, pint, quart, as units of customary liquid measures, and measure to nearest cup, pint quart, half gallon, and gallon.			
				Measures weight in pounds			
Time							
13. Reads clock to specify time on the hour, 1/2 hour and 1/4 hour				Tell and record time using colon notation 12:30, to the hour and half-hour		Same plus to the minute	
14. Reads calendar for days of week, weeks, months, and year				Same			

Table 3: Mathematics Skills Assessed by State and Local School District:

Third Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area						Read temperature on weather thermometer	
Money							
15. States value of penny, nickel, dime, quarter, and half-dollar in cents (¢)	Same			Same but not including half-dollar		Read and write money amounts using $ and ¢ symbols and decimal notation	
16. Counts and states value of coin collections: 1¢ to $1							
17. Finds equivalent sets of coins for nickel, dime, and quarter							
18. Makes change for $1						Same	
F. Relations/Functions Patterns							
19. Recognizes and extends number patterns				Recognizes zero as the numerical equivalent of the empty set.			
				Use zero as the identity element in addition and compares numbers 0-99 using "greater than and less than"			

Table 3: Mathematics Skills Assessed by State and Local School District:

Third Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
				Supply the missing numbers in a sequence of even or odd numbers, 0-99			
G. Statistics							
Statistics							
20. Collects, organizes and interprets data in pictograph form						Same plus bar graphs	
H. Applications/Problem Solving							
Applications/Problem Solving							
21. Makes up a real-life problem from a number sentence				Identify the operation (addition or subtraction) to solve a simple word problem (sums and minuends of 18)		Solve simple one-step word problems involving the four basic operations	
22. Writes and solves a number sentence to reflect a real-life situation				Same but for sums and and minuends less than 100 and multiplication with no factor greater than six			
23. Adds and subtracts sums of money up to $0.99							

Table 4: Mathematics Skills Assessed by State and Local School District:

Fourth Grade

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA *	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area		Round to nearest 10 numbers less than 100 and put in order three numbers less than 1,000. Identify ordinal position of objects in a set of 11-99 objects	Round to nearest 10 100, and 1,000 a 4-digit number Order three numbers less than 1,000 from least to greatest	Use ordinal numbers thru 99th Supply missing numbers in a sequence thru 10,000		Write ordinals to 25th Round to nearest 10 and 100 Recognize the Roman Numerals: I, V, X, L, and C	
A. Numeration							
Counting and Place Value							
1. Reads and writes numerals and expresses place value thru 9,999		Same Identify the number of objects in a set of no more than 1,000 objects	Same Identify the missing numeral in a segment of a whole number line with 1- or 2-digit numerals	Same		Same plus word names and express in expanded form	
Primes, Multiples, Factors				Same plus supply the missing numbers in a sequence of these multiples, and in a sequence of odd and even numbers 100-1000			
2. Names the multiple of numbers 5 and 10		Read and write word names for whole numbers 0-10					
B. Whole Number Operation							
Addition							
3. Adds two 3-digit numbers, regrouping as necessary	Add three 2-digit numbers	Add four 3-digit numbers with and without regrouping and add a 3-digit number to 1-, 2-, 3-digit number	Same	Same		Add 4-digit numbers with regrouping	

Table 4: Mathematics Skills Assessed by State and Local School District:

Fourth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA*	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
Subtraction							
4. Subtracts two 3-digit numbers, regrouping in the 10s only		Subtract two 4-digit numbers, with and without regrouping		Check subtraction by addition			
5. Subtracts two 3-digit numbers, regrouping as necessary	Subtract without zeros 2-digit numbers with borrowing					Same	
Multiplication							
6. Knows products thru 81 (basic facts)	Know multiplication tables thru six	Same	Multiply two 2-digit numbers	Same		Same	
7. Multiplies any number by a 1-digit number, with and without regrouping		Multiply a 1-digit and two 3-digit number		Same		Multiply a 3-digit number by a 1- and 2-digit number, regrouping as necessary	
8. Multiplies any number by 10				Identify the parts of a multiplication problem (include factors and products)			
Division							
9. Knows quotients for dividends thru 81 (basic facts)		Same	Same	Division facts with divisors of 6 or less			

Table 4: Mathematics Skills Assessed by State and Local School District:

Fourth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA *	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
10. Divides a 2-digit number by a 1-digit number with a 1-digit quotient with remainder		Divide a 3-digit number by a 1-digit number with remainder zero, without regrouping	Solves division problems involving 2-digit dividend, 1-digit divisor, with a 2-digit quotient, with no remainder and no regrouping.			Divide 2- and 3-digit numbers by a 1-digit number, regrouping as necessary	
C. Fractional Numbers							
Numeration							
11. Writes a fraction for a part of a whole		Identify equivalent fractions of regions separated into halves, fourths, fifths, eighths, and tenths, and identify one-half, one-third, or one-fourth in a set of 12 objects	Writes the fraction for a region divided into halves, fourths and fifths	Same including 1/5 and 1/6			
Addition							
12. Adds simple fractions with like denominators without regrouping		Same				Same	
Subtraction							
13. Subtracts simple fractions with like denominators		Same				Same	

Table 4: Mathematics Skills Assessed by State and Local School District:

Fourth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA *	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
D. Geometry							
Non-metric							
14. Identifies property of circle: center			Matches figures of same size and shape				
15. Identifies points, lines, and line segments				Same plus including rays			
Metric							
16. Measures perimeter of plane figure				Same			
E. Measurement				Measures volume in liters and measures weight in ounces		Read and record temperature. Mass and capacity units in customary and metric units	
Length							
17. Estimates and measures, using centimeter and meter		Not in Area Same plus using in., ft., and yd.	Identifies length in cm. showing aligned object and ruler	Same plus measure length to nearest half-in., ft, and yd.		Measures using metric and customary units	
Area							
18. Measures surface area by counting				Same			

Table 4: Mathematics Skills Assessed by State and Local School District:

Fourth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA*	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
Time							
19. States time before and after the hour in five-minute intervals	Tell time	Tell time on the hour, half-hour, and quarter hour. State months in order, the date by month, day, and year, and state age in years		Skill assessed at the 5th level		Tell and record time	
Money							
20. Counts and states value of coin collection to $2.00				Write an amount of money using the $ and decimal notation			
* 21. Finds equivalent sets of coins for nickel, dime, quarter, half-dollar and dollar		Read, write, and determine equivalent amounts up to $5.00				Read a price tag and count change in bills and coins to $20.00	
22. Makes change for $2.00 or less			Makes change but limit unspecified	Count change up to $1.00			

Table 4: Mathematics Skills Assessed by State and Local School District:

Fourth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA*	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area				Recognize and apply the following mathematical symbols: <, >, =, +, −, ×, ÷, ≠ Use one as the identity element in multiplication		Recognize and continue number patterns	
F. Relations/Functions Coordinate Geometry 23. Plots a point on a number plane when given an ordered number pair, 1st quadrant.							
G. Statistics Statistics 24. Interprets a bar graph		Read and determine relationships described by pictograph or bar graph expressed in whole units	Read data from bar and line graphs	Interprete data graph in pictorial form		Interpret simple charts, graphs, and tables	
H. Applications/Problem Solving Applications/Problem Solving 25. Writes and solves a number sentence to reflect a real-life situation		Determine solution of real-world problems involving addition and subtraction of 3-digit numbers and multiplication of 1-digit number by a 3-digit number	Solve one-step problems involving the four basic operations			Solve word problems using the four basic operations	

Table 4: Mathematics Skills Assessed by State and Local School District:

Fourth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA*	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
26. Makes up a real-life problem from a number sentence and solves		Determine the change to be received from a $1 bill after the purchase of three items	Same				
27. Solves money problems, using basic operations		Determine the solution of real-world problems involving the addition and subtraction of proper fractions with like denominators, without simplification		Solve word problems involving pounds only or ounces only, no conversion			

*The state of Florida identifies these skills at the beginning of Grade 5 and are thus comparable to LAUSD's end of Fourth Grade.

Table 5: Mathematics Skills Assessed by State and Local School District:

Fifth Grade

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area				Supply missing number in a sequence thru 100,000		Recognize, read, and write Roman Numerals up to 500 Identify even and odd numbers	
A. Numeration							
Counting and Place Value							
1. Reads and writes numerals and expresses place value thru 999,999				Same skills but only thru 100,000		Read and write numerals thru 100,000, and identify place value up to 7-digit	
2. Rounds off to nearest 10						Round to nearest 10, 100, and 1,000 and use to estimate sums and differences	
Primes, Multiples, Factors							
3. Names the multiples of numbers thru 10							
B. Whole Number Operations				Recognize numbers that are divisible by five and recognize that division by zero is not possible		Perform operations using the distributive property	
Addition							
4. Adds numbers of more than 3-digit, regrouping as necessary				Add numbers of up to 5-digits with regrouping		Same	

Table 5: Mathematics Skills Assessed by State and Local School District:

Fifth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
Subtraction							
5. Subtracts from a 4-digit number, with regrouping as necessary	Subtract a 2-digit number from a 3-digit number			Same		Same	
6. Subtracts two numbers, zeros in the minuend							
Multiplication							
7. Multiplies any number by 10 and 100	Multiplication tables thru nine			Multiply 2- and 3-digit numbers by a 1-digit number		Multiply two 2- and 3-digit numbers	
8. Multiplies any number by a 2-digit number, regrouping as necessary	Multiplies a 2-digit number by a 1-digit number					Recall the multiplication facts thru 12, in and out of sequence with accuracy	
Division							
9. Divides a 2-digit number by a 1-digit number, with a 2-digit quotient, with and without remainder.	Division facts thru nine Divide a 2-digit number by a 1-digit number with no remainder			Same skills plus divide a 4-digit number by a 1-digit number with remainder		Divide 3- and 4-digit dividends by 2-digit divisors	

Table 5: Mathematics Skills Assessed by State and Local School District:

Fifth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
10. Divides a 3-digit number by a 1-digit number, with and without remainder				Identify the parts of a division problem			
C. Fractional Numbers							
Numeration							
11. Writes as a fraction, part(s) of a whole and part(s) of a set				Identify the fractional parts 1/8 and 1/10 of a whole		Arrange fractions of like denominators in order; change fractions with terms di divisible by 2, 3, or 4.	
						Simplest form; and change improper fractions to mixed numbers, and the reverse, reducing fractions to lowest terms	
12. Identifies and finds equivalent fractions						Same plus find common denominators	

Table 5: Mathematics Skills Assessed by State and Local School District:

Fifth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
Addition							
13. Adds mixed and whole numbers				Add and subtract simple fractions and mixed numbers with like denominators, no regrouping		Add and subtract mixed numbers and add, subtract, multiply and divide fractions with like denominators	
Subtraction							
14. Subtracts a whole number from a mixed number							
B. Decimals							
Numeration							
15. Identifies and expresses decimal place value thru 10ths				Read and write decimals thru 100ths			
16. Changes fractions with denominators of 10 to decimals				Identify decimals equivalent to 1/2, 1/4, 3/4, 1/5, 4/5, 1/10, 9/10, and 1/100 - 99/100			
Addition/Subtraction				Add and subtract decimals thru 100ths		Add and subtract decimals, dollar and cent symbols correctly	
17. Adds decimals regrouping as necessary				Identify the percent sign			
E. Geometry				Identify the parts of a circle			

Table 5: Mathematics Skills Assessed by State and Local School District:

Fifth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
Non-Metric							
18. Identifies solid figures: cone, cube, sphere, cylinder						Draws and identifies parts of circle, and recognize perpendicular, parallel, horizontal, vertical, and intersecting lines	
Metric							
19. Estimates and measures perimeter of plane figures				Same			
F. Measurement				Measures a weight mass in grams and kilograms		Add or subtract time, clocks, and calendar	
Length				Tell time to the nearest five-minute interval			
20. Estimates and measures, using cm., m., and mm.						Measures to the nearest half or quarter-inch or millimeter	
21. Estimates and measures, using in., ft., and yd.							
Area							
22. Estimates and measures area, using cm^2							

Table 5: Mathematics Skills Assessed by State and Local School District:

Fifth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
23. Estimates and measures area using sq. in.							
Volume/Capacity							
24. Estimates and measures capacity using pint, quart, and cup							
Temperature							
25. Reads temperature to within 1° Celsuis and 2° Fahrenheit							
26. Identifies these points on Celsuis and Fahrenheit scales: boiling, freezing, and body temperature							
Money							
27. Makes change for $5.00 or less							

Table 5: Mathematics Skills Assessed by State and Local School District:

Fifth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area						Interprets simple charts, graphs, and tables, and find the average of six or more quantities	
G. Relations/Functions							
Patterns							
28. Identifies, extends, and creates number patterns							
Coordinate Geometry							
29. Writes an ordered pair for a specific point, 1st quadrant							
H. Applications/Problem Solving							
Applications/ Problem Solving							
30. Writes and solves a number sentence to reflect a real life situation	Solve one-step written word problems			Solve two 2-step word problems using addition, subtraction, multiplication, and money problems involving amounts not exceeding $10.00		Read simple word problems including those with whole numbers, fractions and decimals, decide which operation to use, and calculate the answer	
31. Makes up a real life problem from a number sentence and solves							

Table 5: Mathematics Skills Assessed by State and Local School District:

Fifth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
32. Solves measurement problems (including money problems) using basic operations				Solve word problems involving time in hours only, in minutes only, and days, weeks, months, or years		Solve money problems using basic operations Solve 2-step word problems involving basic operations	

Table 6: Mathematics Skills Assessed by State and Local School District:

Sixth Grade

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area			Identify the word name for a 3- or 4-digit numeral	Read and write number words thru 1,000		Recognize the Roman Numeral symbols: I, V, X, L, C, D and M indicate their value and write Roman Numerals to 2,000	
A. Numeration			Order three numbers less than 1,000 from least to greatest.		Teachers and other school personnel were asked to respond to a survey to determine what skills to assess. The proposed assessment program covered grades 3, 6, 9, and 11. Consequently, no statement can be made at this point regarding the skills assessed at the above grade levels.	Recognize a negative integer on a number line	
Counting and Place Value							
1. Writes and reads numerals and expresses place value thru 1,000,000			Identify place value in a 4-digit numeral	Same plus supply missing numbers in a sequence thru 1,000,000		Same	Read and write, and interpret place value of 5-digit numerals
2. Rounds of to nearest 10 and 100			Rounds a 4-digit number to nearest 10, 100, or 1,000	Round to nearest 10			
B. Whole Number Operations							
Addition							
3. Adds numbers of more than 3-digit numbers, regrouping as necessary			Same			Same	Same
Subtraction							
4. Subtracts numbers of more than 3-digit numbers, regrouping as necessary			Subtract a 4- or 5-digit number from a 5-, 6-, or 7-digit number with regrouping			Same	Same

Table 6: Mathematics Skills Assessed by State and Local School District:

Sixth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
Multiplication							
5. Multiplies any number by a 2-digit number, regrouping as necessary	Multiply two 2-digit numbers		Multiply a 4- or 5-digit number and a 3- or 4- digit number	Same plus multiply by 10, 100, and 1,000		Multiply any whole number by a 4-digit number	Same
Division							
6. Divides a number up to four digits by a multiple of 10, with and without remainder	Divide a 3-digit number by a 1-digit number with no remainder		Divide a 3- or 4-digit number by a 2-digit number with remainder	Divide by a multiple of 10 and divide a 2-digit number by a 2-digit number with no remainder Express remainders as fractions		Divide any whole number by a 3-digit divisor	Same
C. Fractional Numbers							
Numeration							
7. Changes fractions to lowest terms				Continue consecutive equivalency pattern of fractions, 1/2, 2/4, 3/6, etc.			
Addition							
8. Adds fractions with like denominators, with regrouping	Add and subtract like fractions, with sums less than one						

Table 6: Mathematics Skills Assessed by State and Local School District:

Sixth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
9. Adds mixed numbers with like denominators, regrouping as necessary						Same plus division	Add and subtract fractions having unlike denominators
Multiplication							
10. Multiplies a whole number by a fraction, and vice versa							
11. Multiplies any proper fraction by any proper fraction	Same		Same Divide a fraction by a fraction			Multiply and divide mixed numbers	Same
D. Decimals							
Numeration							
12. Identifies and expresses decimal place value through hundredths				Order decimals, limit to hundredths Read and write decimals thru thousandths Identify decimals equivalent to: 1/3, 2/3, 1/6-5/6, 1/8-7/8		Change proper fractions to decimals	
13. Changes fractions with denominators of 10 and 100 to decimals							

Table 6: Mathematics Skills Assessed by State and Local School District:

Sixth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
Addition/Subtraction			Add two 1-, 2-, 3-place decimals	Add and subtract decimals thru thousandths		Perform all basic operations involving decimal numbers and multiply and divide using dollar and cent symbols correctly	
14. Subtracts decimals, regrouping as necessary	Add and subtract decimals thru hundredths		Subtract a 1-, 2-, 3-place decimals from a 2- or 3-place decimals				
Multiplication							
15. Multiplies a decimal by a whole number			Multiply two decimals each with 2 or 3 places				
16. Multiplies a decimal by 10 and 100							
Division							
17. Divides a decimal by a whole number up to 2 digits			Divide a 1-, 2-, or 3-place decimal by a whole number with no remainder				
18. Divides a decimal by 10 and 100							

Table 6: Mathematics Skills Assessed by State and Local School District:

Sixth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area			Given the sides of a rectangle determine the area			Measure simple angles to nearest degree	
E. Geometry				Identify horizontal and vertical lines, and pairs of intersecting and parallel lines			
Non-Metric							
19. Identifies properties of a circle: radius and diameter							
20. Identifies a right angle				Same plus identify parts of an angle			
F. Measurement							
Length			Identifies length in cm. showing aligned object and ruler				
21. Estimates, measures, and determines relationship using cm., m., mm., dm., and km.						Calculate the circumference of a circle	Same
Mass						Add and subtract units of measurement using renaming	
22. Estimates, measures and/or determines relationship, using g. and kg.							Same

Table 6: Mathematics Skills Assessed by State and Local School District:

Sixth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area				Tell time to the nearest minute. Read a thermometer Celsius and/or Fahrenheit			
23. Estimates, measures and/or determines relationship, using ounce and pound							
Area							
24. Estimates, measures and determines relationship of $cm.^2$, $dm.^2$, and $m.^2$						Calculate the perimeter and area of square and rectangle when given length of adjacent sides	Same
25. Estimates, measures and determines relationship of sq. in., sq. ft., and sq. yd.				Compute the area of a square and a rectangle using the appropriate formula			
Volume/Capacity							Same
26. Estimates and measures capacity and determines relationships of liter and milliliter							

Table 6: Mathematics Skills Assessed by State and Local School District:

Sixth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
G. Relations/Functions							
Patterns				Given groups of numbers and specified operations, determine the equality relation between them: <, =, >			
27. Identifies, extends, and creates list(s) of ordered pairs							
28. Names additional ordered number pairs when given a function rule							
Coordinate Geometry							
29. Graphs the ordered number pairs of a function, 1st quadrant							
H. Statistics							
Statistics							
30. Collects data, organizes in bar graph form, and interprets				Same		Same	

Table 6: Mathematics Skills Assessed by State and Local School District:

Sixth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
31. Collects data, organizes in line graph form, and interprets			Same				
32. Determines the mean (average) from a set of data			Same				
I. Percent							
Percent							
33. Changes hundredths fractions to percents, and vice versa						Same Compute a given percent of a whole number	
J. Applications/Problem Solving							
Applications/ Problem Solving							
34. Writes and solves a number sentence to reflect a real-life situation	Solve written word problems		Solve one-step word problems involving the four basic operations			Read simple word problems, including whole numbers, fractions, or decimals, decide which operations to perform, estimate the answer, and calculate the answer correctly.	Estimate and solve problems involving the four basic operations with whole numbers, simple fractions, and decimals

Table 6: Mathematics Skills Assessed by State and Local School District:

Sixth Grade (continued)

	SCHOOL DISTRICT						
LAUSD	MODESTO, CA	FLORIDA	KANSAS	LOUISIANA	NEW JERSEY	TENNESSEE	TEXAS
Skill Area							
35. Makes up a real-life problem from a number sentence and solves							
36. Solves measurement problems (including money problems) using basic operations							Same